

A Fake Review Detection: A Machine Learning-Based Approach

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ABSTRACT:

Fake reviews pose a significant challenge in e-commerce and online services, misleading consumers and damaging business reputations. This study introduces a machine learning-based approach to detect fraudulent reviews, leveraging Natural Language Processing (NLP) techniques and deep learning models. By analyzing textual patterns, sentiment, and reviewer behavior, the system classifies reviews as genuine or fake. The proposed solution enhances the reliability of online reviews, promoting transparency and trust among users. The model is trained on a dataset of real and fake reviews to improve accuracy. Various evaluation metrics are used to assess the system's performance. This approach helps businesses and consumers make informed decisions based on authentic feedback.

KEYWORDS:

Fake review detection, machine learning, NLP, sentiment analysis, deep learning, fraud detection.:

INTRODUCTION:

User-generated evaluations have a significant influence on what individuals choose to purchase because online platforms are growing so rapidly. However, the increasing quantity of fraudulent reviews undermines credibility. Fraudulent reviews can be manually written by humans or generated by automated bots, making detection more challenging. Most of the detection techniques used today are based on statistical or rule-based approaches, which are out of step with evolving fraudulent strategies. This work proposes an AI-driven technique for automatically detecting phoney reviews using a mixed machine learning model.

The suggested system analyses user behaviour, sentiment, and textual patterns using deep learning and Natural Language Processing (NLP) approaches. The model improves accuracy and adaptability by being trained on big datasets of both real and fraudulent reviews.

PROBLEM STATEMENT

User-generated evaluations have a significant influence on what individuals choose to purchase because online platforms are growing so rapidly. However, the increasing quantity of fraudulent reviews undermines credibility. Fraudulent reviews can be manually written by humans or generated by automated bots, making detection more challenging. Most of the detection techniques used today are based on statistical or rule-based approaches, which are out of step with evolving fraudulent activities. This work proposes an AI-driven technique for automatically detecting phoney reviews using a mixed machine learning model.

The suggested system analyses user behaviour, sentiment, and textual patterns using deep learning and Natural Language Processing (NLP) approaches. The model improves accuracy and adaptability by being trained on big datasets of both real and fraudulent reviews. Such a system can improve transparency, safeguard consumers, and guarantee the legitimacy of online marketplaces by putting advanced detection techniques into practice.

OBJECTIVES

The main goal of this research is to create a sophisticated machine learning-based system that can identify fraudulent reviews. The study intends to apply cutting-edge methods in deep learning and natural language processing to improve the dependability of user-generated material. The specific goals listed below are as follows:

1. Using cutting-edge NLP approaches for improved feature extraction, create an efficient machine learning model to categorise reviews as authentic or fraudulent.
2. To improve model accuracy and create a reliable detection system with fewer false positives and false negatives, apply feature engineering and deep learning.
3. To find the most effective strategy for identifying fraudulent reviews across several domains, compare deep learning and classical learning

techniques.

4. Optimise the model for implementation in live online review and e-commerce systems to provide real-time scalability.

5. Improve detection adaptability to evolving fraudulent techniques by integrating continuous learning mechanisms.

LITERATURE REVIEW

Machine learning methods for detecting false reviews have been investigated in a number of studies. Common methods include behavioural analysis, sentiment analysis, and linguistic pattern recognition. Text classification methods are now more accurate thanks to recent developments in deep learning, including transformers and LSTM networks. Nevertheless, there are still difficulties in managing vast amounts of data and adjusting to changing deception tactics. Robust algorithms that are able to identify subtle manipulation tactics are necessary due to the dynamic nature of fake review generation. In order to increase accuracy, researchers have also looked into hybrid models that incorporate several detection methods. Furthermore, the quality of annotations and the availability of datasets are critical factors in model performance. Generalisability across various online platforms is limited by the prevalence of studies that concentrate on domain-specific datasets. Explainable AI is becoming more popular as a way to make fraudulent reviews more transparent.

Existing Methods:

Rule-based filtering, statistical analysis, machine learning, graph-based techniques, and hybrid models are some of the current techniques for detecting bogus reviews. While statistical analysis uses frequency-based techniques to uncover anomalies, rule-based filtering finds reviews with specified suspicious patterns. Automated detection is made possible by machine learning techniques like Support Vector Machines (SVM), Random Forest, and deep learning, which examine user behaviour and analyse material.

Limitations of Existing Systems:

The efficiency of current fake review detecting systems is hampered by a number of issues. Because of their strict predetermined patterns, rule-based detection techniques frequently have large false positive rates, misclassifying legitimate reviews as fraudulent. Because the characteristics of false reviews varies among platforms and businesses, many techniques also have trouble generalising across diverse domains. Furthermore, fraudsters might alter detection models through adversarial review generation techniques, which eventually degrades performance. Despite their strength, deep learning-based techniques are difficult to implement on a broad scale due to their high computational complexity. Additionally, many current systems' inability to detect fraudulent activity in real-time restricts their capacity to quickly detect and stop it, which lowers their overall efficacy in preserving the authenticity of reviews.

ALGORITHM USED

TF-IDF & Word Embeddings:

Feature extraction techniques for textual data.

Random Forest & XGBoost:

Traditional machine learning classifiers.

LSTM & BERT:

Deep learning models for sequential text analysis.

DATASET

The dataset consists of labelled reviews from public repositories including TripAdvisor, Yelp, and Amazon. Duplicate items are eliminated to maintain data integrity and avoid repetition in the analysis. In order to prevent discrepancies that can affect the model's performance, missing values are handled properly. Furthermore, reviews are broken down into their component parts by text tokenisation, which facilitates effective processing and analysis. By improving the dataset, these

preprocessing procedures guarantee that the input for the fake review detection model is of a high calibre.

Feature Selection

- **Lexical features:** Word count, character count, sentiment scores.
- **Syntactic features:** POS tagging, grammatical structures.
- **Semantic features:** Word embeddings, contextual representations.

METHODOLOGY

The suggested method for identifying phoney reviews adheres to a systematic methodology. Review datasets from Yelp, Amazon, and TripAdvisor are extracted and preprocessed as part of the data gathering process. In order to capture significant textual patterns, feature engineering is carried out utilising Natural Language Processing (NLP) techniques as TF-IDF and word embeddings. After that, models for deep learning and machine learning are taught to distinguish between real and fraudulent reviews. The accuracy, precision, recall, and F1-score are among the measures used to assess the model's performance. In order to ensure an automated and effective review verification system, the trained model is then used for real-time detection.

Experimental Setup

TensorFlow and Scikit-learn are the main frameworks used in the Python implementation of the suggested methodology. To verify model reliability and avoid overfitting, cross-validation techniques are used. A variety of setups and hyperparameter adjustments are used to maximise the model's ability to precisely identify fraudulent reviews.

Performance Metrics

TensorFlow and Scikit-learn are the main frameworks used in the Python implementation of the suggested methodology. To verify model reliability and avoid overfitting, cross-validation techniques are used. A variety of setups and hyperparameter adjustments are used to maximise the model's ability to precisely identify fraudulent reviews.

RESULTS AND DISCUSSION

When compared to conventional techniques, the hybrid model showed higher accuracy in identifying fraudulent reviews. By using deep learning, the system's capacity to detect context-aware deceit was enhanced.

Model	Accuracy	Precision	Recall
Random Forest	85%	82%	80%
XGBoost	89%	87%	85%
LSTM	92%	90%	88%
BERT	95%	93%	92%

CONCLUSION

Using a hybrid model that blends machine learning and deep learning methods, this research proposes an AI-based method for identifying fraudulent reviews. By improving detection accuracy, the suggested solution makes user-generated material on internet platforms more dependable and trustworthy. The technology efficiently detects bogus reviews and lessens their negative effects on companies and customers by utilising natural language processing (NLP) techniques and sophisticated classification models. Enhancing the model's resistance to hostile attacks and adjusting to changing fraudulent tactics will be the main goals of future study.

Future Enhancements

Fake review detection systems can be made even more effective with a few improvements. Including multi-modal data—such as user behaviour, information, and images—can improve fraud detection by offering new insights. Live fraud detection will be made possible by implementing the model in real-time on e-commerce platforms, which will stop deceptive reviews from swaying customer choices. Furthermore, putting explainable AI techniques into practice will increase

transparency by enabling organisations and users to comprehend the logic underlying the model's classifications. These developments will help create an ecosystem of online reviews that is more reliable and strong.

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